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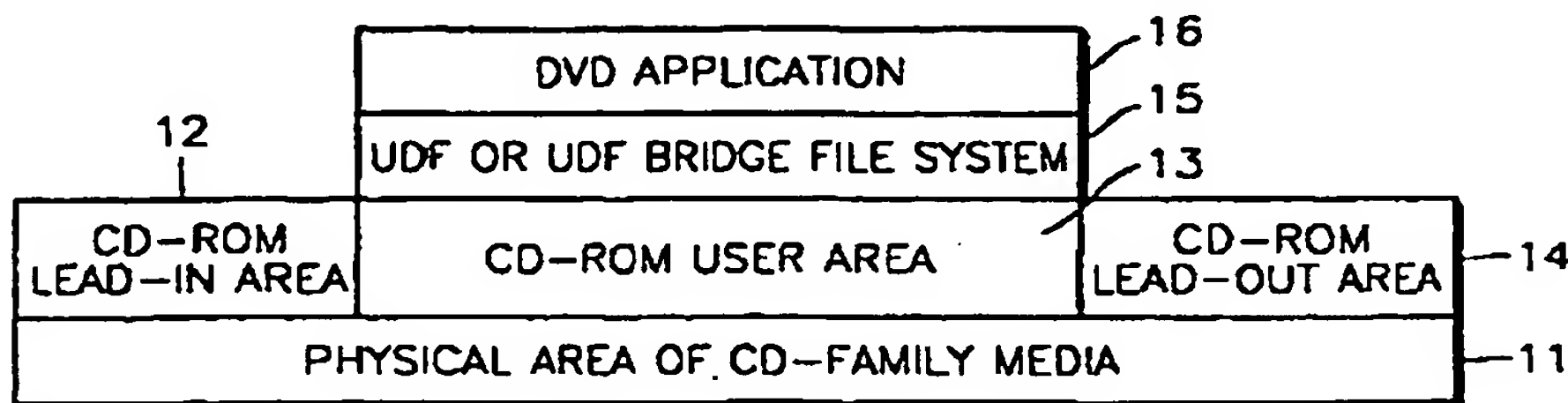
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(54) Optical recording medium having different data formats and appropriate apparatus for recording/reproducing

(57) A disc in which a digital versatile disc (DVD) application is recorded in a physical area of CD media, a recording/reproducing apparatus, and a recording/reproducing method, are provided. In this disc, a lead-in area (12), a lead-out area (14), and a user area (13), each having a compact disc read only memory (CD-ROM) format, are distinguished on a physical area of CD-family media (11), and digital versatile disc (DVD) application (16) based on a predetermined file system

(15) is recorded in the user area (13). Therefore, the disc can be used for music video or presentation which requires short-time reproduction using low-priced CD media, since the DVD application can be recorded on and reproduced from the CD media to obtain a multi-function with a high image quality and a high sound quality, which is possible in DVD application.

FIG. 2



BEST AVAILABLE COPY

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Description

[0001] The present invention relates to the field of optical recording media.

[0002] A DVD video format is used to record and reproduce high image quality video data and/or high sound quality audio data having a transmission rate of about 10 Mbps (mega bits per second). However, DVD is generally used by people who do large-scale marketing, such as film producers, since the manufacture of DVDs is a great expense.

[0003] At present, CDs have become much cheaper, and even common users can directly manufacture CDs with the spread of CD-R (Recordable). Also, 32x-speed CD drives are now on the market due to the development of techniques for CD drives.

[0004] Given that the transmission rate of CDs is about 1.5 Mbps, 8x-speed or greater CD drives have a 10 Mbps or faster transmission rate, so that data recording and reproduction at the same rate as the transmission rate of DVDs is possible. However, the recording time of CDs is much shorter than that of DVDs, so that CDs cannot record data having longer duration. However, CDs can be used when high image quality reproduction is required for a relatively short time for applications such as clips for presentation or promotion.

[0005] However, since existing CD recorders cannot record this high image quality DVD data, new recorders are required. Even if DVD data can be recorded on a CD, existing CD/DVD players will recognize such a CD on which DVD data is recorded as a CD, and play the disc using a playing process for CDs. Thus, reproduction of DVD format data recorded on the CD is not possible, since the disc is a CD in terms of its physical properties but is a DVD in terms of its logical structure.

[0006] In Figure 1, which is a flowchart for illustrating a reproducing method performed by a conventional CD player, a focusing servo is controlled so that the information on the disc loaded into the CD player is properly picked up, and thus the information in a lead-in area of the disc is read, in step S101.

[0007] General CDs include audio CDs, video CDs, and CD-ROMs. A CD-ROM is a disc having a logical format which is used for data recording of a computer in contrast to an audio CD or a video CD. These CDs are differentiated by the control information in a sub-Q area of the lead-in area and top of contents (TOC) information. If an audio CD is prescribed in the control information in the sub-Q area, the CD is immediately recognized as an audio CD. If general data other than the audio CD is prescribed in the control information on the sub-Q area, the CD is recognized as a video CD or a CD-ROM.

[0008] That is, the control information of the sub-Q area in the lead-in area is analyzed in step S102. A determination as to whether an audio CD is prescribed in the control information of the sub-Q area is made

using the above analysis, in step S103. If it is determined in step S103 that an audio CD is prescribed in the control information of the sub-Q area, audio data is reproduced by an audio CD playing process in step S104. If it is determined in step S103 that an audio CD is not prescribed in the control information of the sub-Q area, TOC information is analyzed in step S105.

[0009] Then, it is determined whether a video CD is prescribed in the analyzed TOC information, in step S106. If it is determined in step S106 that a video CD is prescribed in the analyzed TOC information, the video CD information recorded on the first track is read in step S107, and then video data is reproduced by a video CD playing process according to the read first track information in step S108. If it is determined in step S106 that even a video CD is not prescribed in the analyzed TOC information, the disc is recognized as a CD-ROM, and then it is displayed that it is impossible for the CD player to play the loaded disc, in step S109. Then, the playing process is ended.

[0010] In existing CD players for recognizing and playing only audio CDs and video CDs, and existing CD/DVD players for recognizing and playing audio CDs, video CDs, and DVDs, a disc proposed by the present invention, on which DVD format data is recorded on a physical area of CD media, is recognized as a CD, and a reproducing process for general CDs is performed. Therefore, reproduction is not possible.

[0011] With a view to solve or reduce the above problem, an aim of embodiments of the present invention is to provide a disc in which information is recorded in a CD-ROM format in lead-in and lead-out areas on a physical area of CD-family media, and information is recorded on a user area in the logical format of a DVD.

[0012] Another aim is to provide a disc recording apparatus for recording DVD information on a physical area of CD-family media.

[0013] Still another aim is to provide a disc reproducing apparatus for reproducing a disc in which DVD information is recorded on a physical area of CD-family media.

[0014] Yet another aim is to provide a disc recording method of recording DVD information on a physical area of CD-family media.

[0015] Still yet another aim is to provide a disc reproducing method of reproducing a disc in which DVD information is recorded on a physical area of CD-family media.

[0016] Additional aims and advantages of embodiments of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

[0017] According to a first aspect of the invention there is provided a disc wherein a lead-in area, a lead-out area, and a user area, each having a compact disc read only memory (CD-ROM) format, are distinguished on a physical area of CD-family media, and information

having digital versatile disc (DVD) application format based on a predetermined file system is recorded in the user area.

[0018] Preferably, the predetermined file system is a universal disc format (UDF). The predetermined file system may be a universal disc format (UDF) bridge format.

[0019] According to a second aspect of the invention, there is provided an apparatus for recording/reproducing data on/from a physical area of CD-family media which is divided into a lead-in area, a lead-out area, and a user area each having a CD-ROM format, comprising: a DVD application A/V encoder for encoding received audio and/or video (A/V) signals in a DVD format to provide an A/V stream; a first formatter for formatting the A/V stream in a predetermined file system for DVD application; and a second formatter for writing data formatted in the predetermined file system to the user area, formatting data for the lead-in area and the lead-out area in a CD-ROM format, and writing CD-ROM formatted data to the lead-in area and the lead-out area.

[0020] The predetermined file system is a universal disc format (UDF) or a universal disc format (UDF) bridge format.

[0021] The apparatus may further comprise: a differentiator for determining whether a disc loaded into a drive is a CD, and if it is determined that the disc is a CD, again determining whether the CD is a video CD or an audio CD; an analyzer for analyzing whether a predetermined file system exists, if it is determined by the differentiator that the disc is neither a video CD nor an audio CD; a first deformatter for deformatting a DVD application which has been written to the user area when the predetermined file system exists, and providing first deformatted data; and a first decoder for decoding the first deformatted data to restore the original A/V signal.

[0022] The apparatus may further comprise: a second deformatter for deformatting a CD application which has been read from a loaded disc, if it is determined by the differentiator that the disc is a video CD or an audio CD, and providing second deformatted data; and a second decoder for decoding the second deformatted data to restore the original A/V signal.

[0023] The apparatus may include a first differentiator for determining whether a disc loaded into a DVD/CD-ROM dual-purpose drive is a DVD or CD, by checking the physical structure of the disc; a second differentiator for determining whether the disc is a video CD or an audio CD, if it is determined by the first differentiator that the disc is a CD; an analyzer for analyzing whether a predetermined file system exists, if it is determined by the second differentiator that the disc is neither a video CD nor an audio CD, or if it is determined by the first differentiator that the disc is a DVD; a first deformatter for deformatting a DVD application which has been read from the disc if the predetermined file system exists and providing first deformatted data; a first decoder for decoding the first deformatted data to

restore the original A/V signal; a second deformatter for deformatting a CD application which has been read from the loaded disc if it is determined by the second differentiator that the disc is a video CD or audio CD and providing second deformatted data; and a second decoder for decoding the second deformatted data to restore the original A/V signal.

[0024] According to another aspect of the invention, there is provided a method for recording/reproducing data on/from a physical area of CD-family media which is divided into a lead-in area, a lead-out area, and a user area each having a CD-ROM format, comprising: (a) encoding received audio and/or video (A/V) signals in a DVD format to provide an A/V stream; (b) formatting the A/V stream in a predetermined file system for DVD application; and (c) writing data formatted in the predetermined file system to the user area, formatting data for the lead-in area and the lead-out area in a CD-ROM format, and writing CD-ROM formatted data to the lead-in area and the lead-out area.

[0025] The predetermined file system may be a universal disc format (UDF) or a universal disc format (UDF) bridge format.

[0026] The method may further comprise: (d) determining whether a disc loaded into a drive is a CD, and if it is determined that the disc is a CD, again determining whether the CD is a video CD or an audio CD; (e) determining whether a predetermined file system exists, if it is determined in step (d) that the CD is neither a video CD nor an audio CD; (f) deformatting a DVD application written to the user area when the predetermined file system exists and providing first deformatted data; and (g) decoding the first deformatted data to restore the original A/V signal. The method may further comprise (h) deformatting a CD application which has been read from a loaded disc if it is determined in step (d) that the disc is a video CD or audio CD, and providing second deformatted data; and (i) decoding the second deformatted data to restore the original A/V signal.

[0027] The method may further comprise the steps of (d) determining whether a disc loaded into a drive is an audio CD, by analyzing control information in a sub-Q area of the lead-in area of the disc; (e) playing an audio CD if it is determined in step (d) that the disc is an audio CD, and, if it is determined in step (d) that the disc is not an audio CD, determining whether the disc is a video CD by analyzing top of contents (TOC) information; (f) analyzing video CD information on the first track and playing a video CD according to analyzed video CD information, if it is determined in step (e) that the disc is a video CD, and, if it is determined in step (d) that the disc is not even a video CD, analyzing a UDF; and (g) reproducing DVD data if it is determined in step (f) that a DVD application exists.

[0028] The method may comprise the steps of (d) discriminating whether a disc loaded into a DVD/CD-ROM dual-purpose drive is a DVD or a CD, by checking the physical structure of the disc; (e) determining the

type of CD if it is determined in step (d) that the physical structure of the disc is a CD; (f) determining whether a predetermined file system exists, if it is determined in step (d) that the physical structure of the disc is a DVD or if it is determined in step (e) that the CD is neither a video CD nor an audio CD; (g) deformatting a DVD application read from the loaded disc, when the predetermined file system exists, and providing first deformat-
 ted data; and (h) decoding the first deformatted data to restore the original A/V signal. The method may further comprise the steps: (i) deformatting a CD application, which has been read from the loaded disc, if it is determined in step (e) that the CD is a video CD or audio CD, and providing second deformatted data; and (j) decoding the second deformatted data to restore the original A/V signal.

[0029] The method may comprise the steps: (d) determining whether a disc loaded into a DVD/CD-ROM dual-purpose drive is a DVD or CD, by analyzing the physical structure of the disc; (e) determining whether the disc is an audio CD, by analyzing control information in a sub-Q area of the lead-in area of the disc, if it is determined in step (d) that the physical structure of the disc is a CD; (f) playing an audio CD if it is determined in step (e) that the disc is an audio CD, and, if it is determined in step (e) that the disc is not an audio CD, determining whether the disc is a video CD by analyzing TOC information; (g) analyzing video CD information on the first track and playing a video CD according to analyzed video CD information, if it is determined in step (f) that the disc is a video CD, and, if it is determined in step (f) that the disc is not even a video CD, analyzing a UDF; and (h) reproducing DVD data if it is determined in step (g) that a DVD application exists. The method may further comprise: (i) analyzing a UDF if it is determined in step (d) that the physical structure of the disc is a DVD; and (j) reproducing DVD data if it is determined in step (i) that a DVD application exists.

[0030] For a better understanding of the invention, and to show how embodiments of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings in which:

Figure 1 is a flowchart illustrating a reproducing method performed by a conventional CD player;

Figure 2 is a view illustrating an example of the structure of a disc according to an embodiment of the present invention;

Figure 3 is a block diagram illustrating an embodiment of a recording apparatus according to the present invention;

Figure 4 is a block diagram illustrating an embodiment of a reproducing apparatus according to the present invention;

Figure 5 is a block diagram illustrating another embodiment of a reproducing apparatus according to the present invention;

Figure 6 is a flowchart illustrating an embodiment of a reproducing method according to the present invention; and

Figure 7 is a flowchart illustrating another embodiment of a reproducing method according to the present invention.

[0031] Reference will now be made in detail to the present preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below in order to explain the present invention by referring to the figures.

[0032] The structure of a disc according to an embodiment of the present invention is shown in Figure 2, and a CD, a CD-R (Recordable) or a CD-RW (Rewritable) is used as the disc medium. In Figure 2, a CD-ROM format is used on a physical area of CD-family media 11. That is, the CD-ROM format is divided into a lead-in area 12, a user area 13, and a lead-out area 14. Thus, both the control information and TOC information in the lead-in area 12 use the same format as a general CD-ROM format. That is, the format used on the physical area of CD-family media 11 is a CD-ROM format which is different to the format of an audio CD or a video CD.

[0033] The logical format of the user area 13 follows a DVD format. The DVD format is based on a file system which is called a universal disk format (UDF). The specifications of a file system 15 and a DVD application 16 which is based on the file system have already been defined by the DVD forum.

[0034] In the disc as shown in Figure 2, the lead-in area 12, the user area 13 and the lead-out area 14 on the physical area of CD-family media 11 are distinguished on the basis of the format of a CD-ROM. Information corresponding to the CD-ROM format is recorded in the lead-in area 13 and the lead-out area 14. The logical volume area of the user area 13 records the DVD application 16 based on the file system 15 such as a UDF file system or a UDF bridge format. Here, the UDF bridge format is a format where a UDF, and an international standard organization (ISO) 9660 format which is used in general CD-ROMs, coexist. A CD-ROM drive installed in a computer requires the ISO 9660 format to read a disc, so the UDF bridge format is used. However, the file system format can include only the UDF if the formats for the file system are all changed into the UDF with the lapse of time.

[0035] Figure 3 is a block diagram illustrating an embodiment of a disc recording apparatus according to the present invention, including a DVD application A/V

encoder 102, a DVD application formatter 104, a CD-ROM formatter 106 and a recording processor 108.

[0036] The DVD application A/V encoder 102 encodes received audio and/or video (A/V) signals in accordance with a DVD application. If a video signal is received, it is coded using a specification which is defined in a DVD video application book, and a coded video stream is provided. If an audio signal is received, it is encoded using a specification which is defined in a DVD audio application book, and an encoded audio stream is provided. The DVD application formatter 104 formats the encoded audio and video streams received from the DVD application A/V encoder 102, and the information associated with the corresponding streams using a file system of a UDF or a UDF bridge format, and provides DVD application formatted data.

[0037] The CD-ROM formatter 106 writes the DVD application formatted data received from the DVD application formatter 104 to the user area distinguished on the basis of the CD-ROM format, and writes lead-in data and lead-out data, which are defined in the CD-ROM format, to the lead-in area and the lead-out area distinguished on the basis of the CD-ROM format. The recording processor 108 digitally signal-processes data received from the CD-ROM formatter 106, and records the resultant data on a physical area of CD-family media.

[0038] Figure 4 is a block diagram illustrating an embodiment of a reproducing apparatus according to the present invention. The reproducing apparatus includes a CD-ROM drive 202, a CD differentiator 204, a CD application deformatter 206, a CD application A/V decoder 208, a UDF analyzer 210, a DVD application deformatter 212, and a DVD application A/V decoder 214.

[0039] When a disc is loaded into the CD-ROM drive 202 which supports an 8x-speed or faster transmission rate and can access an audio CD, a video CD, and a CD on which DVD format data is recorded, the CD differentiator 204 determines whether the loaded disc is a general audio CD or a general video CD. That is, the CD differentiator 204 determines whether the disc loaded into the CD-ROM drive 202 is an audio CD, using the control information in a sub-Q area of the lead-in area on the disc. If it is determined that the disc is an audio CD, the CD differentiator 204 provides a differentiation signal to the CD application deformatter 206. If it is determined that the disc is not an audio CD, the CD differentiator 204 analyzes TOC information to determine whether the disc is a video CD. If it is determined that the disc is a video CD, the CD differentiator 204 provides a differentiation signal to the CD application deformatter 206. On the other hand, if it is determined that the disc is neither an audio CD nor a video CD, the CD differentiator 204 provides a differentiation signal representing the result of the determination to the UDF analyzer 210. The CD application deformatter 206 deformats data which has been read from the disc

according to the differentiation signal, in accordance with an audio CD application or a video CD application. The CD application A/V decoder 208 decodes CD application deformatted data to output the original A/V signal.

[0040] The UDF analyzer 210 determines that the loaded disc has a UDF file system if the differentiation signal from the CD differentiator 204 represents that the loaded disc is neither an audio CD nor a video CD. If it is determined that the disc has a UDF file system and that the file system is used for DVD application, the DVD application deformatter 212 deformats data read from the disc in accordance with DVD application. The DVD application A/V decoder 214 decodes DVD application deformatted data to reproduce the original A/V signal.

[0041] The reproducing apparatus shown in Figure 4 plays general CDs (e.g., an audio CD and a video CD) and a disc proposed by the present invention on which a DVD application is recorded on a physical area of CD media. However, the present invention is also applicable to an apparatus for playing only discs on which a DVD application is recorded on a physical area of CD media, without playing general CDs, the apparatus capable of including the CD-ROM drive 202, the CD differentiator 204, the UDF analyzer 210, the DVD application deformatter 212, and the DVD application A/V decoder 214.

[0042] Figure 5 is a block diagram illustrating another embodiment of a disc reproducing apparatus according to the present invention. The disc reproducing apparatus includes a DVD/CD-ROM drive 302, a DVD/CD differentiator 304, a CD differentiator 306, a CD application deformatter 308, a CD application A/V decoder 310, a UDF analyzer 312, a DVD application deformatter 314, and a DVD application A/V decoder 316, and can play both a general DVD and a disc proposed by the present invention in which a DVD application is recorded on a physical area of CD media.

[0043] The DVD/CD-ROM drive 302 can access a CD or DVD on which DVD formatted data is recorded, and particularly, has a 8x-speed or greater transmission rate when the loaded disc is a CD. The DVD/CD differentiator 304 determines the physical structure of a loaded disc. If the loaded disc has a physical structure corresponding to a CD, the DVD/CD differentiator 304 provides a differentiation signal representing that the physical structure of the disc corresponds to a CD, to the CD differentiator 306, but if the loaded disc has a physical structure corresponding to a DVD, the DVD/CD differentiator 304 provides a differentiation signal representing that the physical structure of the disc corresponds to a DVD, to the UDF analyzer 312.

[0044] The CD differentiator 306 determines that the CD is an audio CD or a video CD, if the differentiation signal provided from the DVD/CD differentiator 304 represents that the physical structure of the loaded disc corresponds to a CD. If the CD is an audio CD or a video CD, the CD differentiator 306 provides a differentiation signal representing that the CD is an audio CD or video

CD, to the CD application A/V decoder 310. If the CD is neither an audio CD nor a video CD, the CD differentiator 306 provides a differentiation signal representing the result of the determination to the UDF analyzer 312.

[0045] The structures and operations of the CD application deformatter 308, the CD application A/V decoder 310, the UDF analyzer 312, the DVD application deformatter 314, and the DVD application A/V decoder 316 are the same as those shown in Figure 4, so they will not be described again.

[0046] Figure 6, which is a flowchart illustrating an embodiment of a disc reproducing method according to the present invention, will now be described with reference to the disc reproducing apparatus shown in Figure 4. First, the information in the lead-in area of a disc loaded into the CD-ROM drive 202 is read, in step S201. Then, the control information in the sub-Q area of the lead-in area is analyzed, in step S202. If it is determined in step S203 that the control information on the sub-Q area corresponds to an audio CD, the audio CD is played, in step S204. If it is determined in step S203 that the control information in the sub-Q area does not correspond to an audio CD, TOC information is analyzed, in step S205.

[0047] If it is determined in step S206 that the analyzed TOC information corresponds to a video CD, video CD information is read from a first track, in step S207. Then, video CD is played according to the read first track information, in step S208.

[0048] If it is determined in step S206 that the analyzed TOC information does not correspond to a video CD, a UDF is analyzed in step S209, and then the existence or non-existence of a DVD application is determined in step S210. If it is determined in step S210 that a DVD application exists, DVD data is reproduced in step S211. Otherwise, the disc reproducing process is concluded.

[0049] Figure 7, which is a flowchart illustrating another embodiment of a disc reproducing method according to the present invention, will now be described with reference to the reproducing apparatus shown in Figure 5. In Figure 7, the physical structure of a disc loaded into the DVD/CD-ROM drive 302 is checked, in step S301. If it is determined in step S302 that the physical structure thereof is a CD, the control information in the sub-Q area is analyzed in step S303. Steps S303 through S313 are the same as the steps S201 through S211 shown in Figure 6, so they will not be described again.

[0050] On the other hand, if it is determined in step S302 that the physical structure of the loaded disc is not a CD, another determination as to whether the physical structure thereof is a DVD is made in step S314. If it is determined in step S314 that the loaded disc is a DVD, the step S311 of analyzing a UDF is performed. Otherwise, the process is concluded.

[0051] As described above, the recording apparatus according to embodiments of the present invention

can record a DVD application on a physical area of CD media, and a disc in which a DVD application is recorded on a physical area of CD media can be reproduced by the embodiments of reproducing apparatus of the present invention. Also, embodiments of the present invention can be used for music video or presentation which requires reproduction for a short period of time using low-priced CD media, since DVD applications can be recorded on and reproduced from the CD media to obtain a multi-function with a high image quality and a high sound quality, which is possible in DVD application.

[0052] The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

[0053] All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

[0054] Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

[0055] The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

Claims

1. A disc wherein a lead-in area (12), a lead-out area (14), and a user area (13), each having a compact disc read only memory (CD-ROM) format, are distinguished on a physical area of CD-family media (11), and information having digital versatile disc (DVD) application format (16) based on a predetermined file system (15) is recorded in the user area (13).
2. The disc of claim 1, wherein the predetermined file system is a universal disc format (UDF) (15).
3. The disc of claim 1, wherein the predetermined file system (15) is a universal disc format (UDF) bridge format.
4. An apparatus for recording/reproducing data on/from a physical area of CD-family media which is

divided into a lead-in area (12), a lead-out area (14), and a user area (13) each having a CD-ROM format, comprising:

a DVD application A/V encoder (102) for encoding received audio and/or video (A/V) signals in a DVD format to provide an A/V stream;

a first formatter (104) for formatting the A/V stream in a predetermined file system for DVD application; and

a second formatter (106) for writing data formatted in the predetermined file system to the user area, formatting data for the lead-in area and the lead-out area in a CD-ROM format, and writing CD-ROM formatted data to the lead-in area and the lead-out area.

5. The apparatus of claim 4, wherein the predetermined file system is a universal disc format (UDF).

6. The apparatus of claim 4, wherein the predetermined file system is a universal disc format (UDF) bridge format.

7. The apparatus of claim 4, further comprising:

a differentiator (204) for determining whether a disc loaded into a drive is a CD, and if it is determined that the disc is a CD, again determining whether the CD is a video CD or an audio CD;

an analyzer (210) for analyzing whether a predetermined file system exists, if it is determined by the differentiator (204) that the disc is neither a video CD nor an audio CD;

a first deformatter (212) for deformatting a DVD application which has been written to the user area when the predetermined file system exists, and providing first deformatted data; and

a first decoder (214) for decoding the first deformatted data to restore the original A/V signal.

8. The apparatus of claim 7, further comprising:

a second deformatter (206) for deformatting a CD application which has been read from a loaded disc, if it is determined by the differentiator (204) that the disc is a video CD or an audio CD, and providing second deformatted data; and

a second decoder (208) for decoding the second deformatted data to restore the original A/V signal.

9. The apparatus of claim 4, further comprising:

a first differentiator (304) for determining whether a disc loaded into a DVD/CD-ROM dual-purpose drive is a DVD or CD, by checking the physical structure of the disc;

a second differentiator (306) for determining whether the disc is a video CD or an audio CD, if it is determined by the first differentiator (304) that the disc is a CD;

an analyzer (312) for analyzing whether a predetermined file system exists, if it is determined by the second differentiator (306) that the disc is neither a video CD nor an audio CD, or if it is determined by the first differentiator that the disc is a DVD;

a first deformatter (314) for deformatting a DVD application which has been read from the disc if the predetermined file system exists and providing first deformatted data;

a first decoder (316) for decoding the first deformatted data to restore the original A/V signal;

a second deformatter (308) for deformatting a CD application which has been read from the loaded disc if it is determined by the second differentiator that the disc is a video CD or audio CD and providing second deformatted data; and

a second decoder (310) for decoding the second deformatted data to restore the original A/V signal.

10. A method for recording/reproducing data on/from a physical area of CD-family media which is divided into a lead-in area, a lead-out area, and a user area each having a CD-ROM format, comprising:

(a) encoding received audio and/or video (A/V) signals in a DVD format to provide an A/V stream;

(b) formatting the A/V stream in a predetermined file system for DVD application; and

(c) writing data formatted in the predetermined file system to the user area, formatting data for the lead-in area and the lead-out area in a CD-

ROM format, and writing CD-ROM formatted data to the lead-in area and the lead-out area.

11. The method of claim 10, wherein the predetermined file system is a universal disc format (UDF). 5

12. The method of claim 10, wherein the predetermined file system is a universal disc format (UDF) bridge format. 10

13. The method of claim 10, further comprising:

(d) determining whether a disc loaded into a drive is a CD, and if it is determined that the disc is a CD, again determining whether the CD is a video CD or an audio CD; 15

(e) determining whether a predetermined file system exists, if it is determined in step (d) that the CD is neither a video CD nor an audio CD; 20

(f) deformatting a DVD application written to the user area when the predetermined file system exists and providing first deformatted data; and 25

(g) decoding the first deformatted data to restore the original A/V signal.

14. The method of claim 13, further comprising: 30

(h) deformatting a CD application which has been read from a loaded disc if it is determined in step (d) that the disc is a video CD or audio CD, and providing second deformatted data; and 35

(i) decoding the second deformatted data to restore the original A/V signal.

15. The method of claim 10, further comprising: 40

(d) determining whether a disc loaded into a drive is an audio CD, by analyzing control information in a sub-Q area of the lead-in area of the disc; 45

(e) playing an audio CD if it is determined in step (d) that the disc is an audio CD, and, if it is determined in step (d) that the disc is not an audio CD, determining whether the disc is a video CD by analyzing top of contents (TOC) information; 50

(f) analyzing video CD information on the first track and playing a video CD according to analyzed video CD information, if it is determined in step (e) that the disc is a video CD, and, if it is determined in step (d) that the disc is not 55

even a video CD, analyzing a UDF; and

(g) reproducing DVD data if it is determined in step (f) that a DVD application exists.

16. The method of claim 10, further comprising:

(d) discriminating whether a disc loaded into a DVD/CD-ROM dual-purpose drive is a DVD or a CD, by checking the physical structure of the disc;

(e) determining the type of CD if it is determined in step (d) that the physical structure of the disc is a CD;

(f) determining whether a predetermined file system exists, if it is determined in step (d) that the physical structure of the disc is a DVD or if it is determined in step (e) that the CD is neither a video CD nor an audio CD;

(g) deformatting a DVD application read from the loaded disc, when the predetermined file system exists, and providing first deformatted data; and

(h) decoding the first deformatted data to restore the original A/V signal.

17. The method of claim 16, further comprising:

(i) deformatting a CD application, which has been read from the loaded disc, if it is determined in step (e) that the CD is a video CD or audio CD, and providing second deformatted data; and

(j) decoding the second deformatted data to restore the original A/V signal.

18. The method of claim 10, further comprising:

(d) determining whether a disc loaded into a DVD/CD-ROM dual-purpose drive is a DVD or CD, by analyzing the physical structure of the disc;

(e) determining whether the disc is an audio CD, by analyzing control information in a sub-Q area of the lead-in area of the disc, if it is determined in step (d) that the physical structure of the disc is a CD;

(f) playing an audio CD if it is determined in step (e) that the disc is an audio CD, and, if it is determined in step (e) that the disc is not an audio CD, determining whether the disc is a

video CD by analyzing TOC information;

(g) analyzing video CD information on the first track and playing a video CD according to analyzed video CD information, if it is determined in step (f) that the disc is a video CD, and, if it is determined in step (f) that the disc is not even a video CD, analyzing a UDF; and

(h) reproducing DVD data if it is determined in step (g) that a DVD application exists.

19. The method of claim 18, further comprising:

(i) analyzing a UDF if it is determined in step (d) that the physical structure of the disc is a DVD; and

(j) reproducing DVD data if it is determined in step (i) that a DVD application exists.

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FIG. 1 (PRIOR ART)

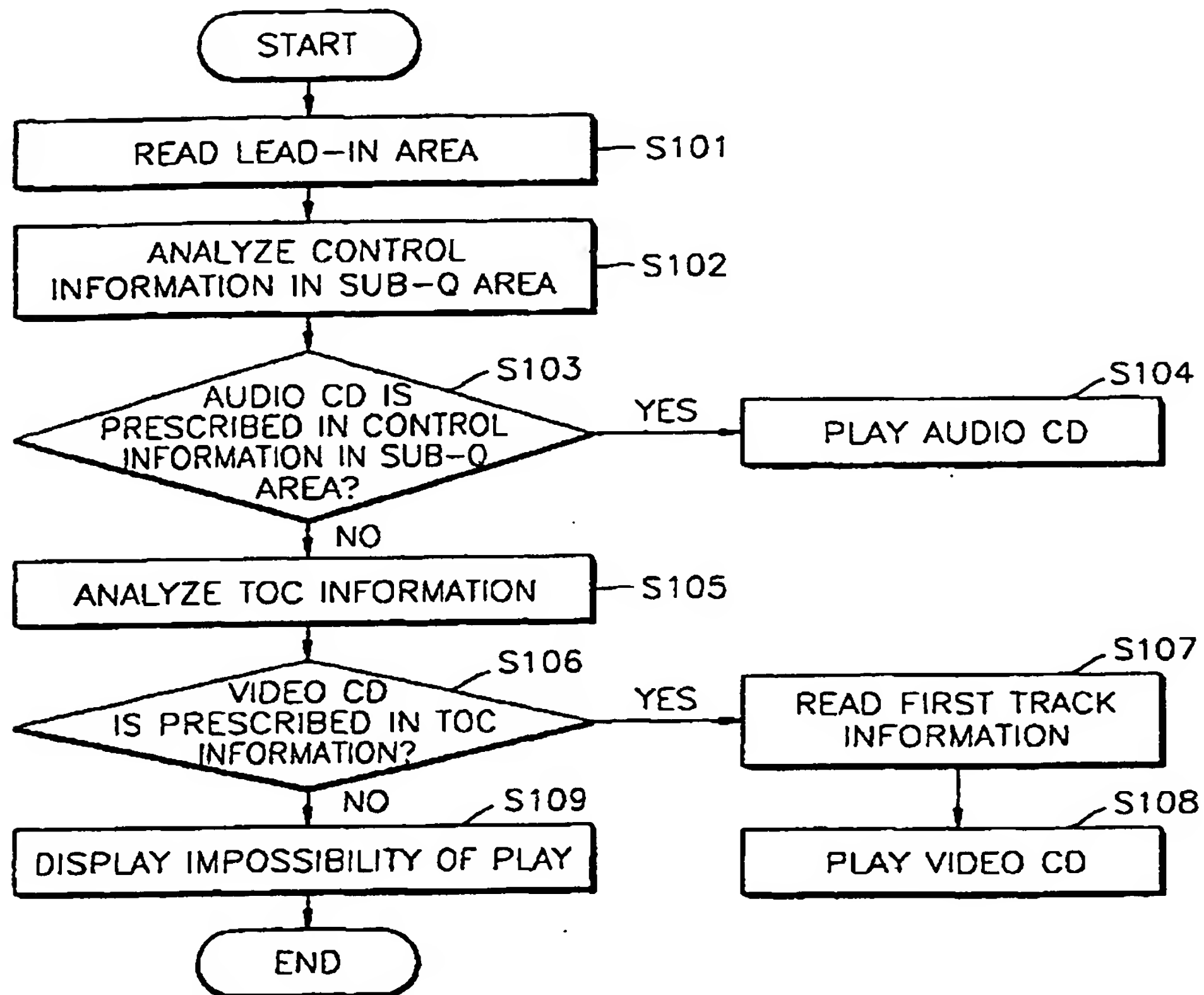


FIG. 2

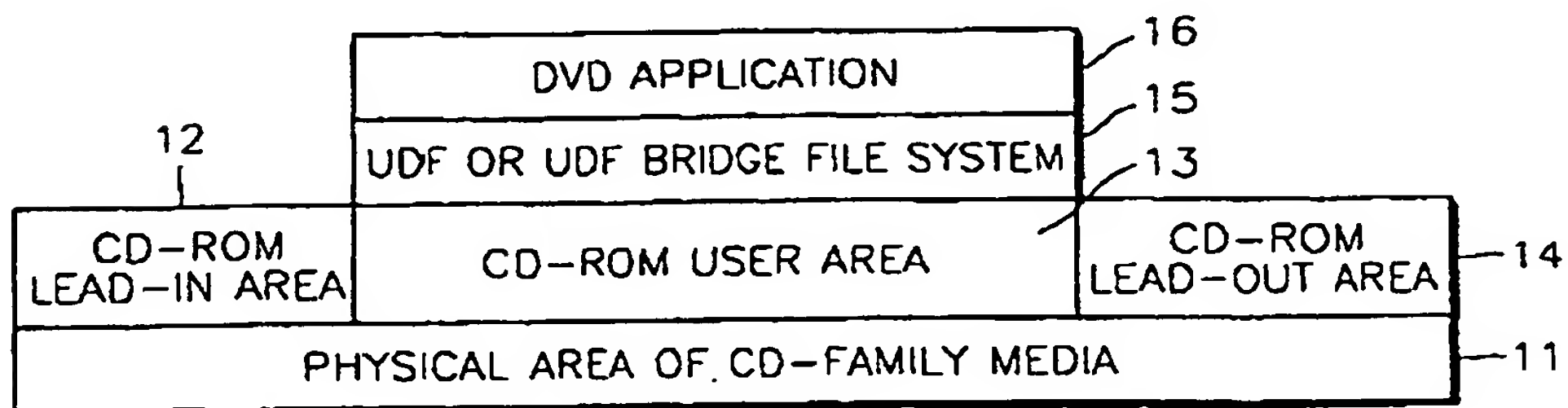


FIG. 3

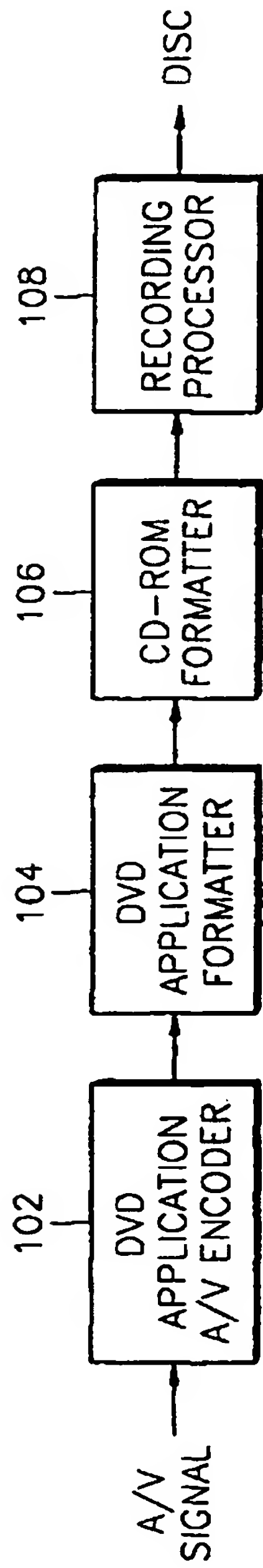


FIG. 4

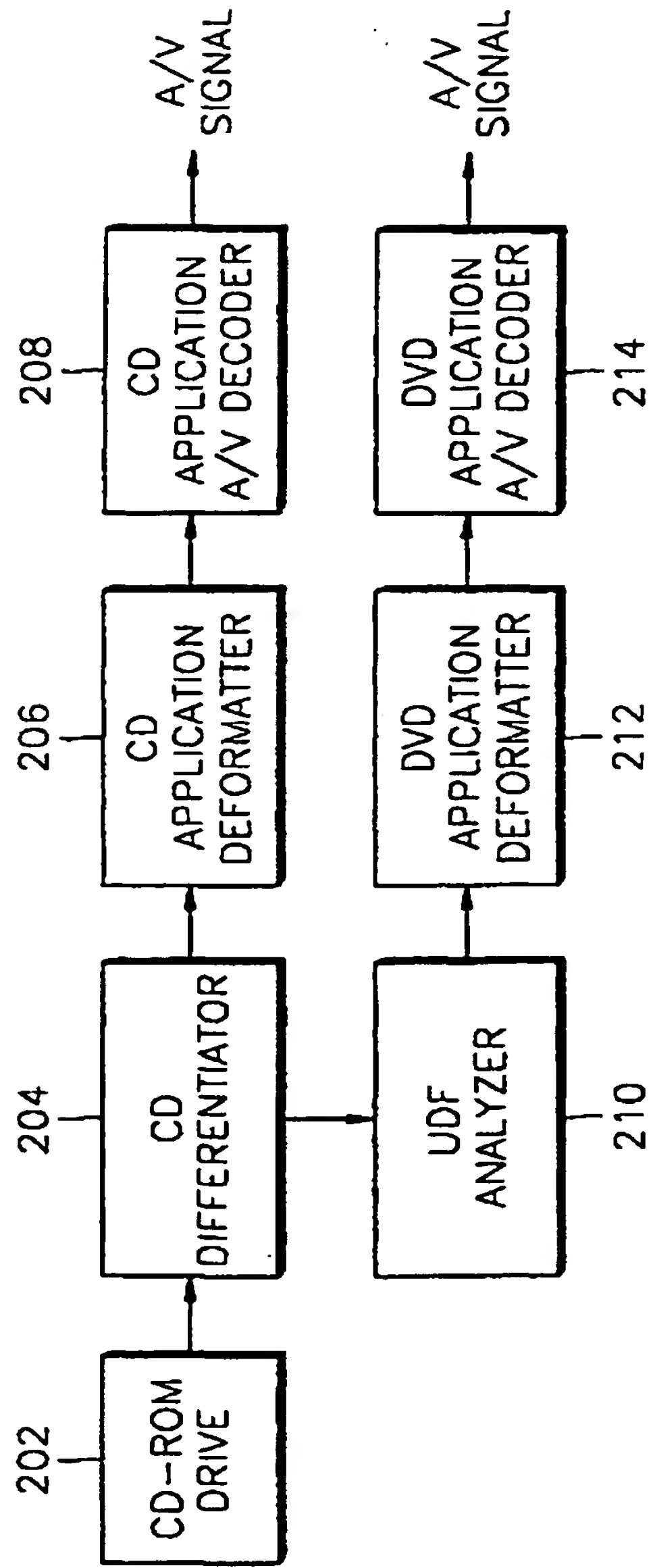


FIG. 5

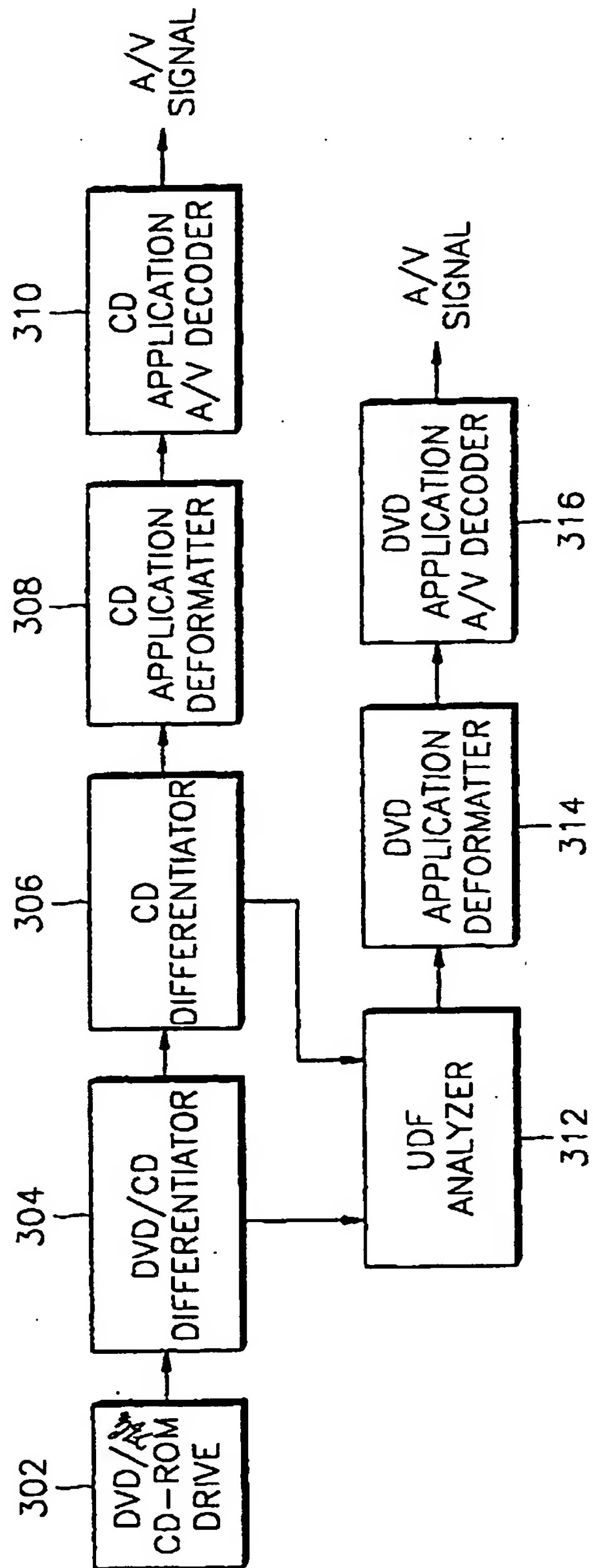


FIG. 6

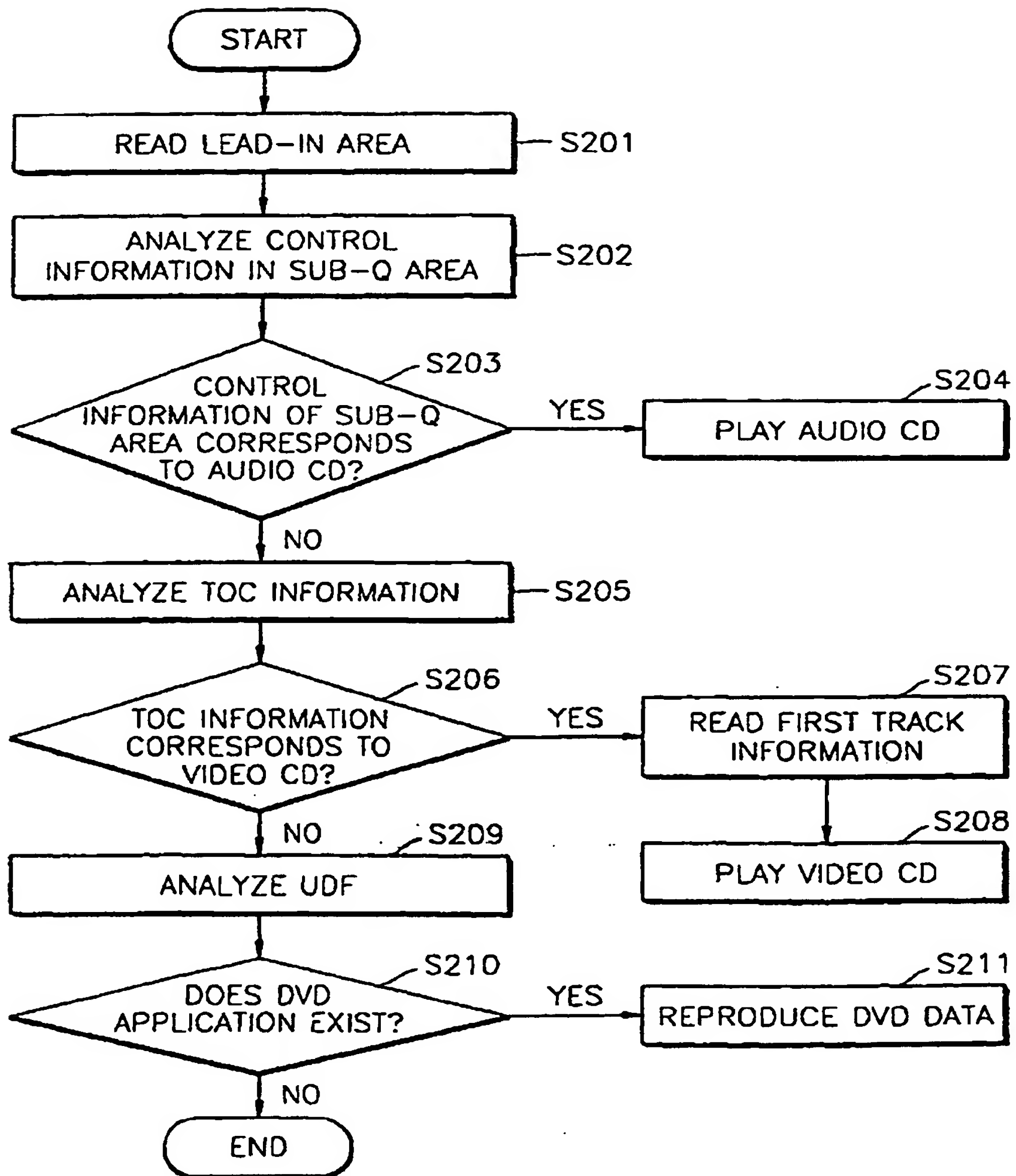
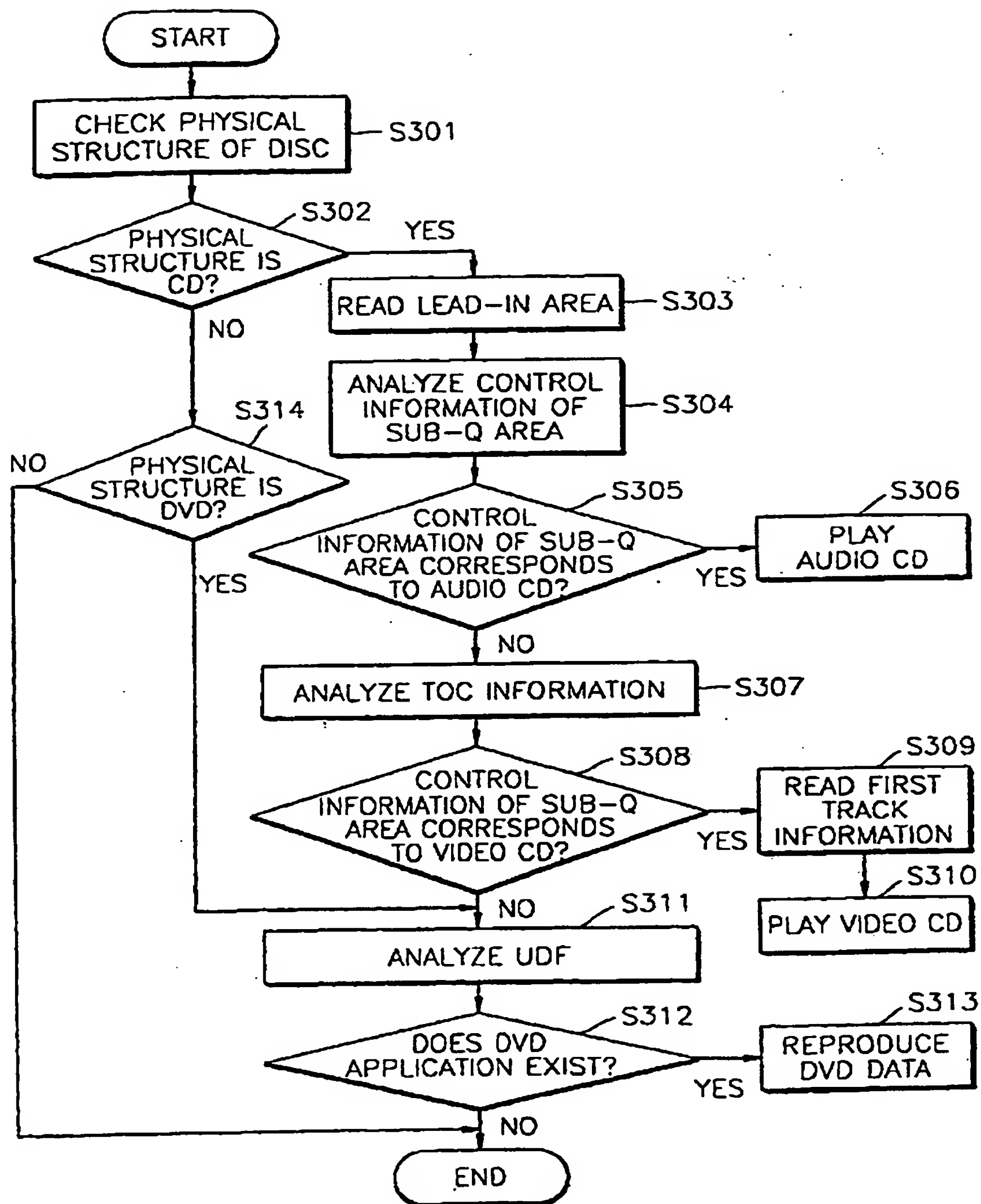


FIG. 7



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